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### REMARKS

Claims 1 - 7 and 18 - 41 are pending in the present application. No claims have been amended leaving Claims 1 - 7, 18 - 41 for consideration upon entry of the present response. Reconsideration and allowance of the claims is respectfully requested in view of the following remarks.

#### Claim Rejections under 35 U.S.C. §103

Claims 1 - 7 and 18 - 26 and 28 - 41 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over U.S. Patent No. 5,225,154 to Kanno (hereinafter "Kanno") in view of U.S. Patent No. 4,810,461 to Inagaki (hereinafter "Inagaki"). (Office Action dated 06-26-2003, page 2)

In making the rejection, the Examiner has stated that "Kanno et al. teach (see Abstract) a nuclear fuel cladding with three layers, an inner zirconium metal layer, an outer Zircaloy-2 layer and an intermediate layer. (Office Action dated 06-26-2003, page 2). The Examiner has further stated that "Inagaki et al. teach (see Abstract) an  $\alpha$ -zirconium-based alloy that is used as a nuclear fuel cladding. (Office Action dated 06-26-2003, page 3)

The Examiner has additionally stated that

it would have been obvious to one of ordinary skill in the art to have made the nuclear fuel cladding of Kanno et al using the  $\alpha$ -Zr-alloy of Inagaki et al as the middle layer because Inagaki et al teach (see Col. 3, lines 56-58, Col. 8, lines 16-19 and Table 3) as the middle layer because Inagaki et al teach that the alloy possessed adequate strength and ductility to satisfy the requirements of the intermediate layer of Kanno et al and the alloy of Inagaki et al provides (see Col. 7, lines 55-67) lower neutron absorption than the stainless steel or Cu-alloy of Kanno et al which is highly advantageous for a nuclear fuel rod cladding.

(Office Action dated 06-26-2003, page 4)

The Examiner has further stated that

With respect to the property of the coarse grained lath  $\alpha$  microstructure, the composition and method of forming the alloy taught by Inagaki et al are substantially identical to the disclosed composition and process, therefore, one of ordinary skill in the art

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would have expected that the products taught by the reference would have the same coarse grained lath microstructure as claimed

(Office Action dated 06-26-2003, page 4)

The claims are directed to a creep resistant zirconium-based alloy for use in nuclear fuel cladding, wherein the zirconium-based alloy comprises a coarse grained lath alpha microstructure, wherein the zirconium-based alloy comprises a middle annular layer in the cladding disposed between an inner annular layer in the cladding and an outer annular layer in the cladding, and wherein the zirconium-based alloy comprises approximately 1.2-1.7 weight percent Sn, approximately 0.13 to less than 0.20 weight percent Fe, approximately 0.06-0.15 weight percent Cr, approximately 0.05-0.08 weight percent Ni, and the balance being substantially zirconium. (Claim 1)

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Kanno teaches a fuel assembly for a nuclear reactor comprising a fuel cladding tube of three-layer structure having an outer surface in contact with reactor water of the nuclear reactor, an inner surface layer in contact with the nuclear fuel, and an intermediate layer interposed between the outer surface layer and the inner surface layer. the outer surface layer is made of a Zr-based alloy containing Nb, Sn and Mo. (see Abstract) The inner surface layer is made of pure zirconium. (see Abstract) Kanno teaches an intermediate layer comprising a stainless steel or a copper alloy. (Col. 4, lines 22 - 34). The Examiner is right in conceding that Kanno does not teach a zirconium based alloy with a coarse grained lath alpha microstructure. (Office Action dated 06-26-

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2003, page 4) Kanno in not teaching an inner layer comprising the zirconium based alloy does not teach all elements of the present claims.

Inagaki teaches a zirconium-based alloy with a high corrosion resistance, consisting essentially of 1 to 2 wt % Sn, 0.20 to 0.35 wt % Fe, 0.03 to 0.16 wt % Ni and the balance substantially Zr. (see Abstract) Inagaki however teaches a material that does not have the coarse grained lath alpha microstructure. While the Examiner has conceded that Inagaki does not expressly teach that the  $\alpha$ -phase of the zirconium is coarse grained lath  $\alpha$  microstructure, he has asserted that the microstructure must be substantially identical since the composition and process are reasonably identical. (Office Action dated 06-26-2003, page 4) Applicants respectfully disagree.

In the first instance, Inagaki does not disclose any cooling rate (as is sently claimed) during the quench nor does Inagaki refer to a "beta heat treating followed by a fast quench" as stated by the Examiner on page 3 of the Office Action dated 06-26-2003. More specifically, Inagaki makes absolutely no mention of a fast quench as stated by the Examiner. Inagaki states that that the quenching is conducted preferably in cooling water flowing in a crude tube or by applying water jet or spray. One of ordinary skill in the art would have no way of discerning the rate at which the cooling could occur since Inagaki does not provide any formula (such as the volume of water/minute/unit mass of the object to be quenched) or cooling device for this rapid quenching to take place. Inagaki therefore in not teaching or suggesting the lath microstructure or teaching the specific conditions under which it could be produced, does not teach all elements of the claimed invention and does not compensate for the deficiency of Kanno.

Further there is no motivation to combine Inagaki with Kanno. One of ordinary skill in the art desirous of obtaining the advantageous properties provided by the lath microstructure in the zirconium based alloy would not look to Inagaki for the motivation to produce such a structure since a) there is absolutely no discussion of such a structure and b) the method of quenching prescribed by Inagaki is neither accurate nor precise in showing one of ordinary skill in the art how to derive the lath microstructure. Inagaki therefore does not provide any motivation for one of ordinary skill in the art to make a combination with Kanno. The Applicants further believe that the Examiner has used hindsight provided by the claimed invention to make the rejection. In this regards the

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courts have stated that "[f]urther, even assuming that all elements of an invention are disclosed in the prior art, an Examiner cannot establish obviousness by locating references that describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would have impelled one skilled in the art to do what the patent applicant has done. *Ex parte Levengood*, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. Int. 1993). The references, when viewed by themselves and not in retrospect, must suggest the invention. *In Re Skoll*, 187 U.S.P.Q. 481 (C.C.P.A. 1975)".

In addition, one of ordinary skill in the art would have no expectation of success in combining Inagaki with Kanno. In the first instance, when metals are combined into a multilayered system, it is generally desirable for various properties of the metals such as the coefficients of expansion to be close to one another, so as to prevent failure of the multilayered device. In the claimed invention, the inner layer comprising a zirconium alloy having the lath microstructure is disposed upon and in intimate contact with an inner layer comprising zirconium and an outer layer comprising a zirconium alloy. One of ordinary skill in the art upon reading Inagaki and not being apprised about the lath microstructure or its properties would be hard pressed to predict that a zirconium alloy with the lath microstructure would indeed function effectively in a multilayered article that is subjected to the corrosive environment and high temperatures of a nuclear reactor. That the claimed multilayered material having the claimed layers actually functions in the corrosive and high temperature environment of a reactor is evidence of success, success that was neither predicted or suggested by either Kanno or Inagaki.

In summary, since neither Kanno or Inagaki teaches all elements of the claimed invention, since there is no motivation to make the combination, and since there is no reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made, the Examiner has not made a prima facie case of obviousness over Kanno in view of Inagaki. The Applicants therefore respectfully request a withdrawal of the rejection and an allowance of the claims.

Claims 1 - 7 and 18 - 26 and 28 - 41 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over U.S. Patent No. 5,225,154 to Kanno in view of U.S. Patent

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No. 4,810,461 to Inagaki as applied to claims 1 - 7, 18 - 26 and 28 - 35 above, and in view of U.S. Patent No 4,056,328 to Cheadle. (Office Action dated 06-26-2003, page 2)

Cheadle teaches tubes for use in nuclear reactors fabricated from a quaternary alloy comprising 2.5-4.0 wt% Sn, 0.5-1.5 wt% Mo, 0.5-1.5 wt% Nb, balance essentially Zr. (see Abstract) The tubes are fabricated by a process of hot extrusion, heat treatment, cold working to size and age hardening, so as to produce a microstructure comprising elongated  $\alpha$  grains with an acicular transformed beta grain boundary phase. (see Abstract) Cheadle teaches a composition consisting essentially of Sn 2.5-4.0%, Mo 0.5-1.5%, Nb 0.5-1.5%, oxygen 800-1300 ppm, with the balance being zirconium (Col. 2, lines 4 - 7). The claimed invention is directed at a composition comprising approximately 1.2-1.7 weight percent Sn, approximately 0.13 to less than 0.20 weight percent Fe, approximately 0.06-0.15 weight percent Cr, approximately 0.05-0.08 weight percent Ni, and the balance being substantially zirconium. Since the composition taught by Cheadle differs from the claimed composition, Cheadle does not teach all elements of the claimed invention.

Additionally since Cheadle teaches a composition that is different from the claimed composition, one of ordinary skill in the art would not be motivated to combine Kanno with Inagaki and Cheadle. One of ordinary skill in the art upon reading Cheadle would not be motivated to combine Cheadle with Inagaki since the compositions taught by the two references are not identical. Once again the Applicants maintain that the Examiner has made the combination with the hindsight afforded by the present invention. Applicants therefore respectfully request a withdrawal of the rejection over Kanno in view of Inagaki, and further in view of Cheadle.

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If there are any additional charges with respect to this response or otherwise,  
please charge them to Deposit Account No. 06-1130 maintained by Assignee.

Respectfully submitted,

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